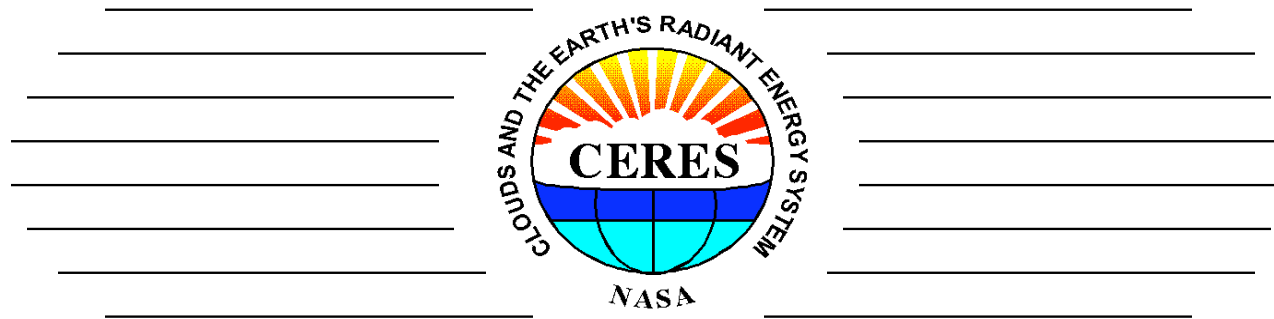


# CERES FLIGHT MODEL 5 (FM5) GROUND CALIBRATIONS



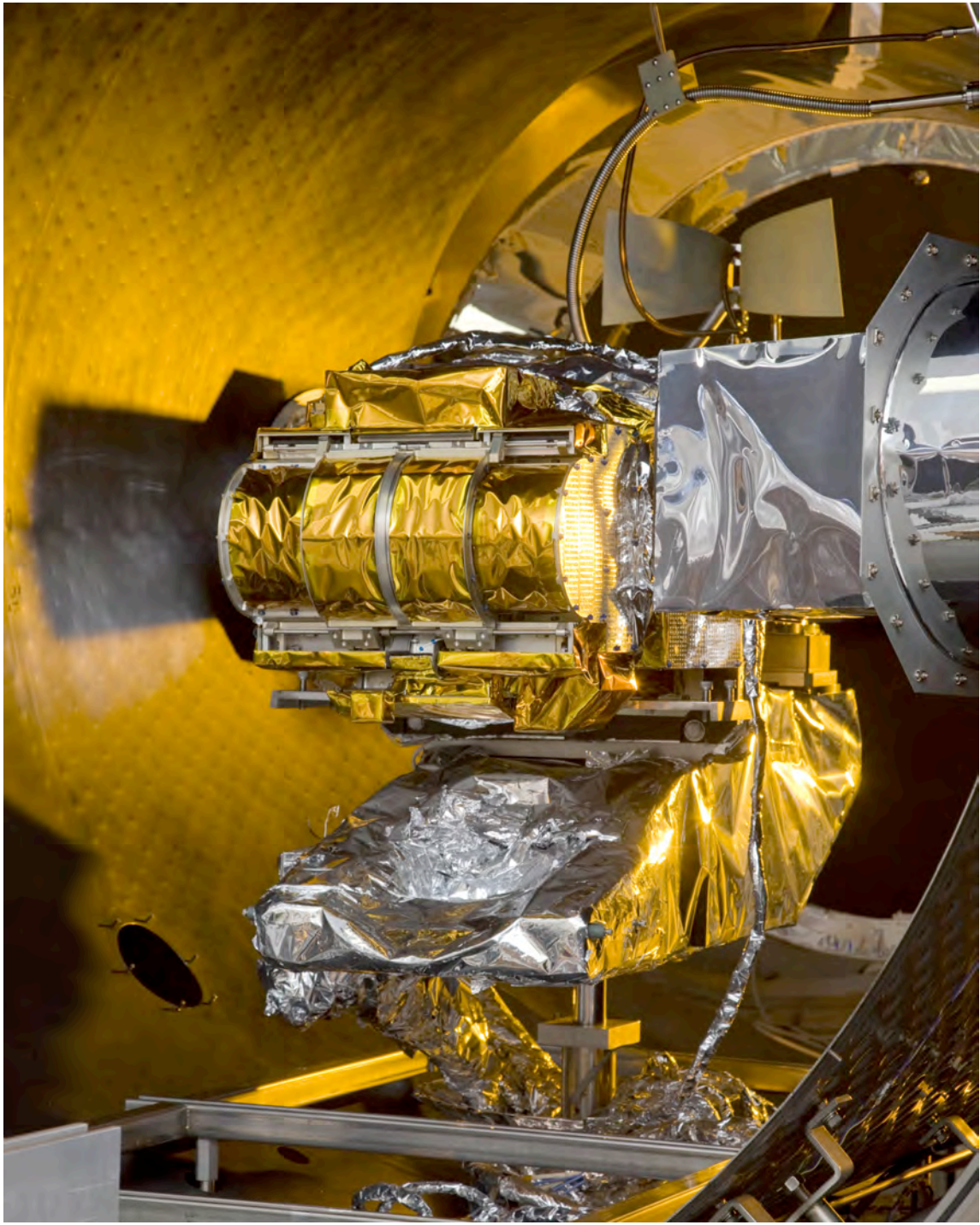
**Susan Thomas**  
**CERES Instrument Team**

**CERES Science Team Meeting**  
NASA GISS, New York City, New York  
October 27, 2009



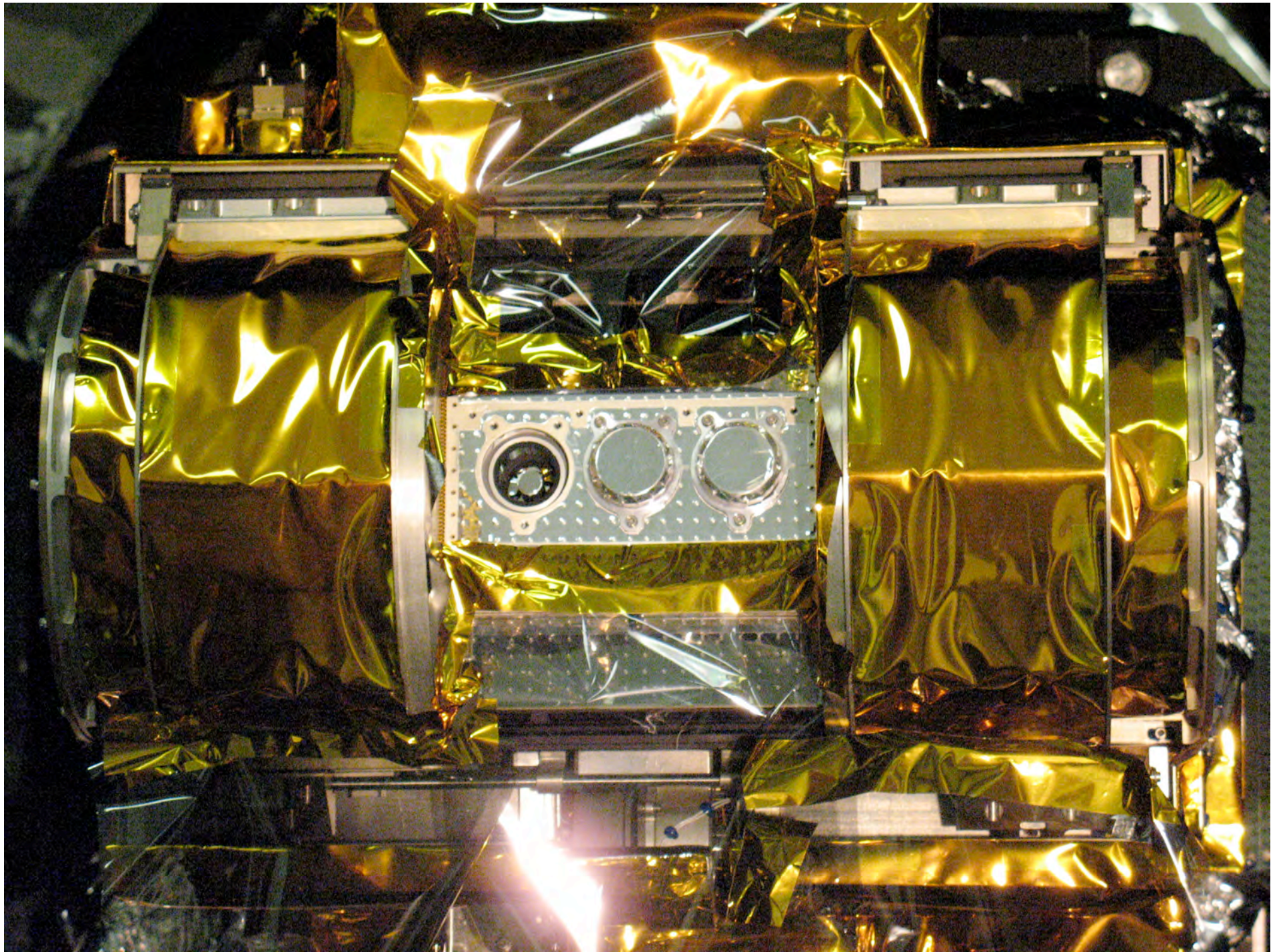
NASA Langley Research Center

**Atm****spheric**  
SCIENCES



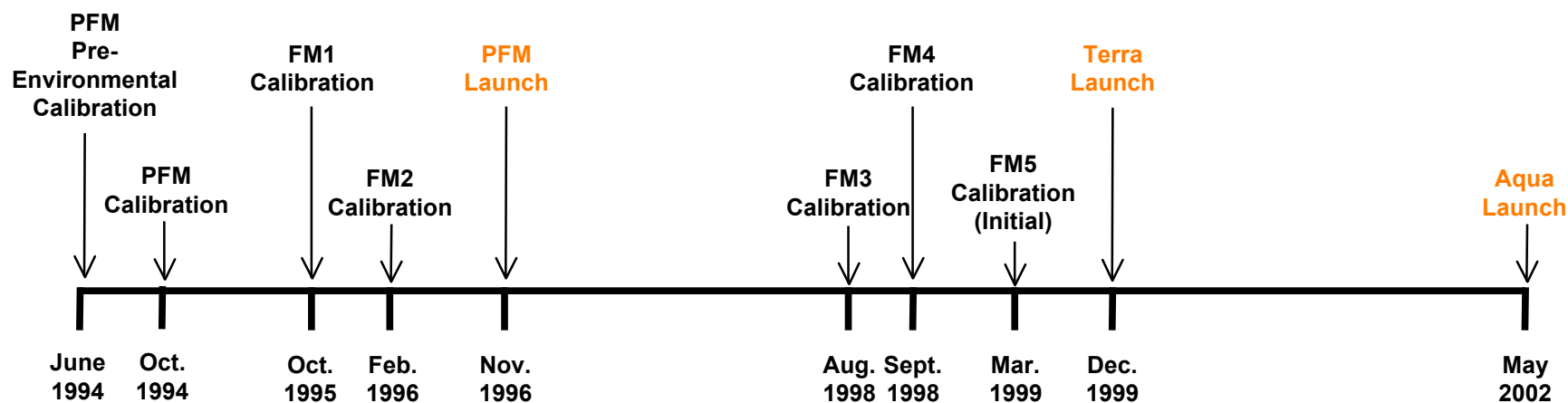








## CERES INSTRUMENTS TIMELINE GROUND CALIBRATION AND LAUNCH



PFM – Proto Flight Model – TRMM spacecraft

FM1 – Flight Model 1 – TERRA spacecraft

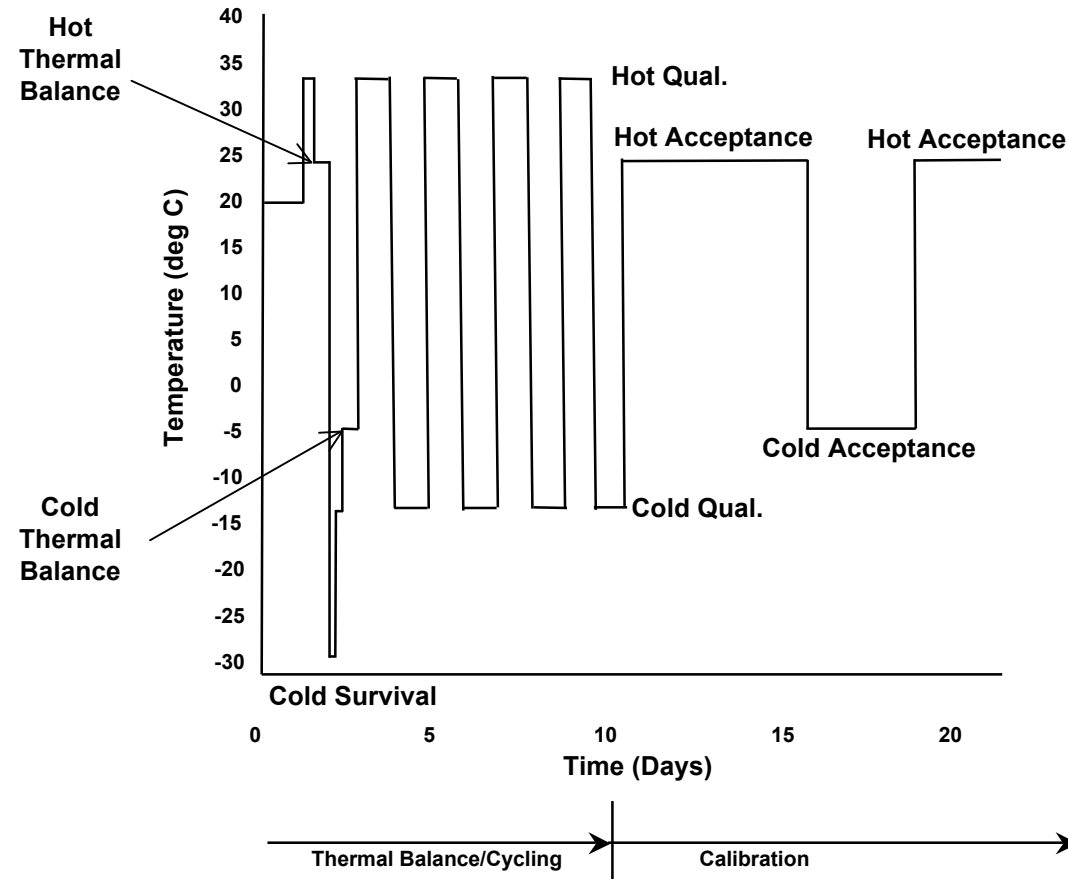
FM2 – Flight Model 2 – TERRA spacecraft

FM3 – Flight Model 3 – AQUA spacecraft

FM4 – Flight Model 4 – AQUA spacecraft

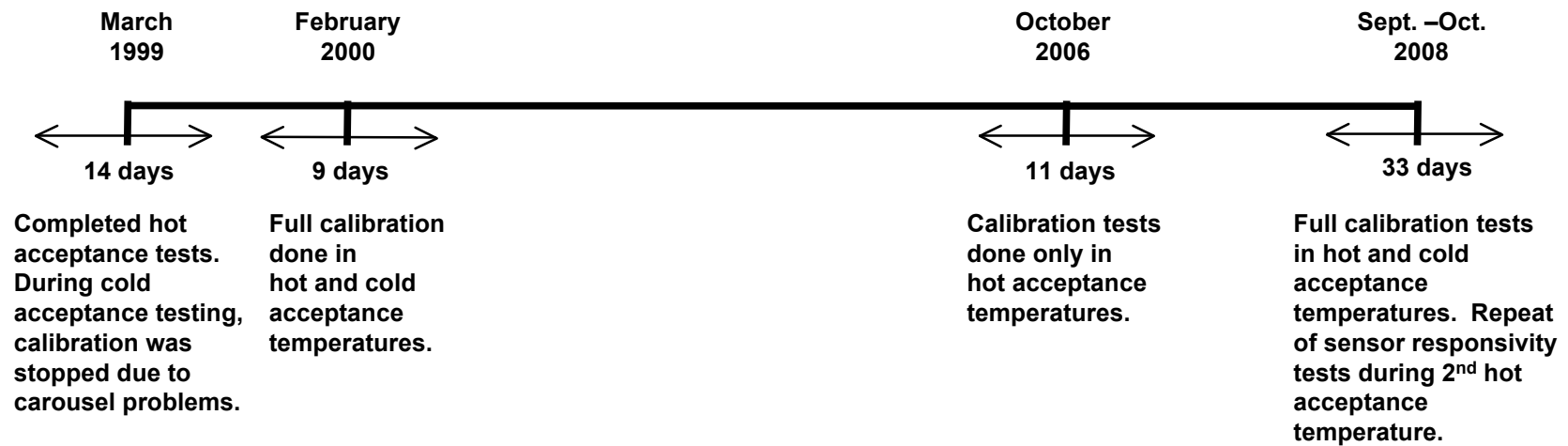
FM5 – Flight Model 5 – NPP spacecraft

# CERES NOMINAL THERMAL VACUUM TEST PROFILE

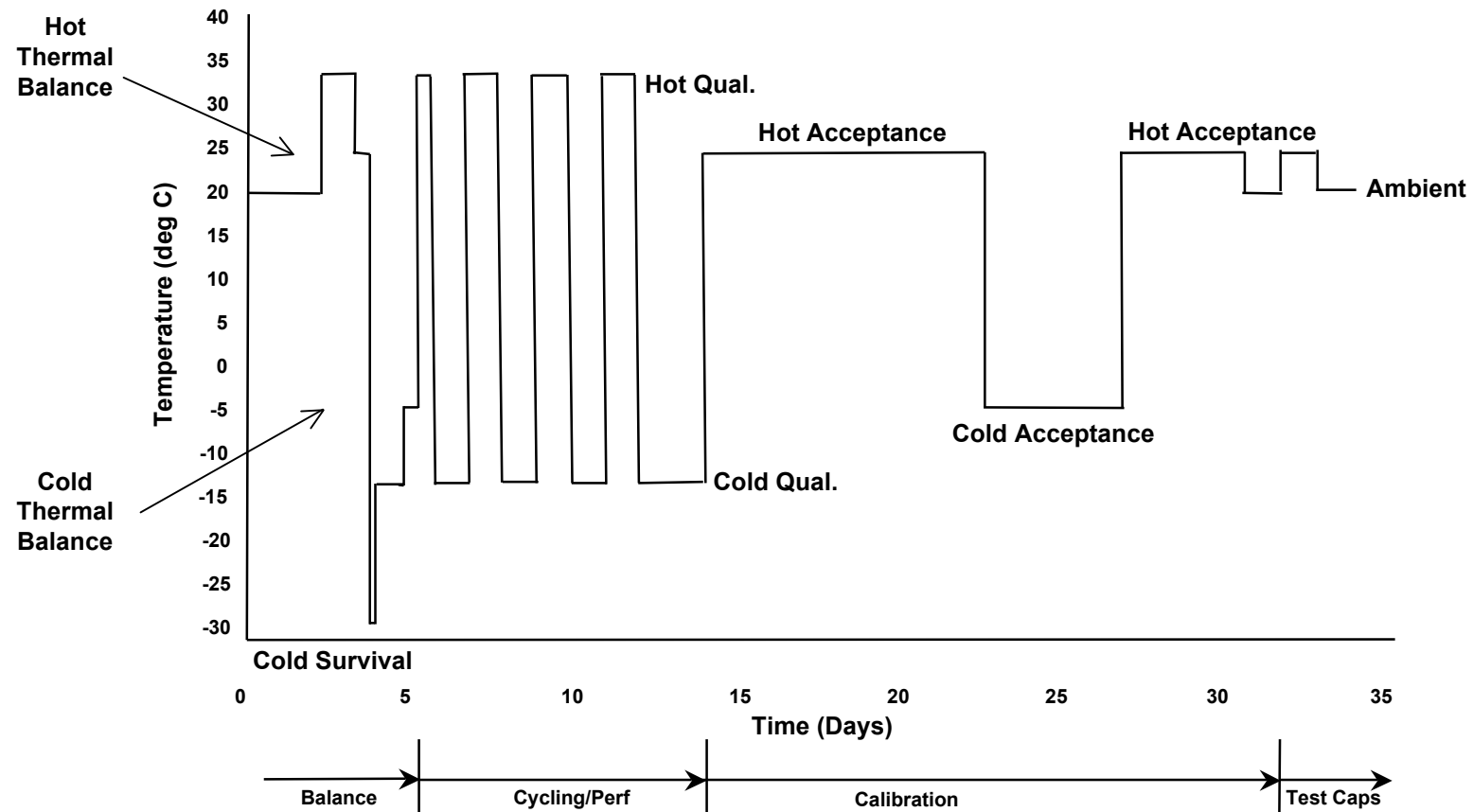


	Tests	Source
Hot Acceptance:	Longwave Responsivity Shortwave Responsivity Shortwave Spectral Characterization	Narrow Field of View Blackbody Shortwave Reference Source with KDP Filter Shortwave Reference Source with Narrowband Filters
Cold Acceptance:	Longwave Responsivity Shortwave Responsivity	Narrow Field of View Blackbody Shortwave Reference Source with KDP Filter

## CERES FM5 INSTRUMENT GROUND CALIBRATION



# CERES FM5 2008 THERMAL VACUUM TEST PROFILE





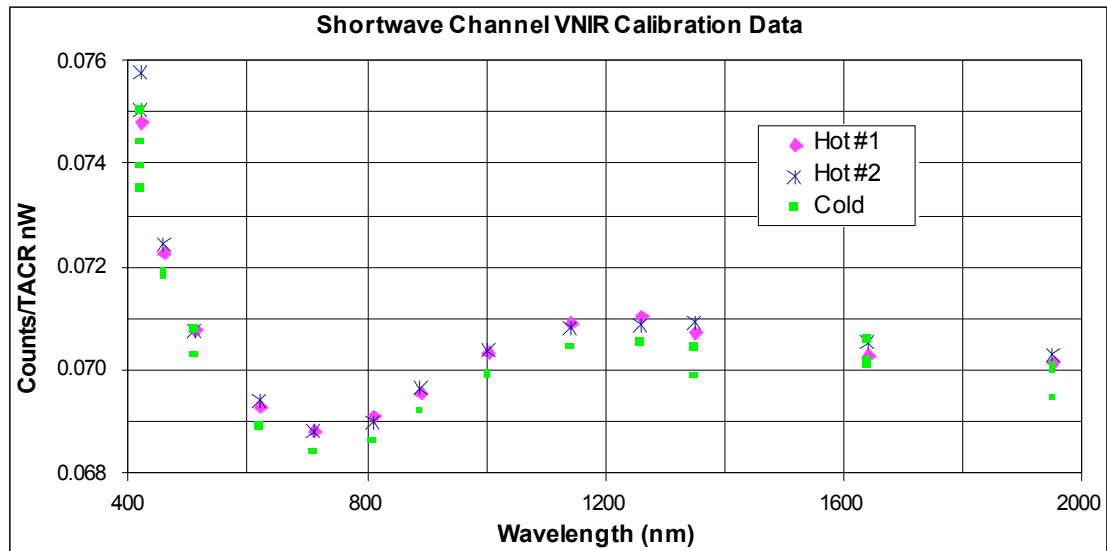
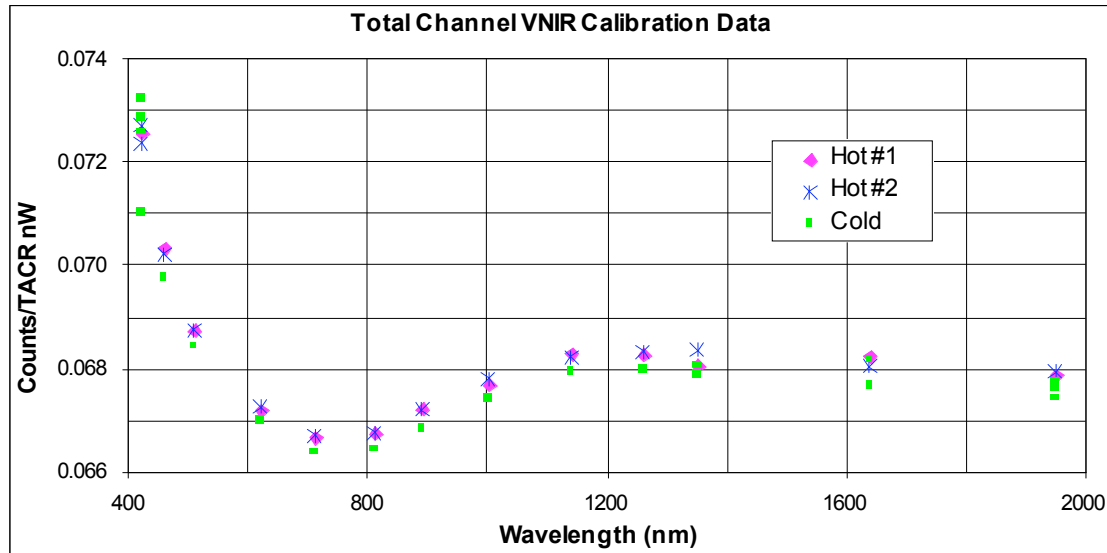
# Ground Calibration Tests

- Longwave Responsivity
- Shortwave Responsivity and Spectral Characterization
- Linearity in Sensor Responsivity
- Point Response Function Test
- MAM Characterization
- Calibrations using on-board sources

# Enhancements for 2008 FM5 Calibrations

- Longest time under vacuum conditions
- Repeat of Longwave and Shortwave responsivity tests during the second hot acceptance temperature.
- Newly devised test to calculate the longwave responsivity, in addition to NGST legacy test.
- MAM characterization test to support the new in-flight raster scan solar calibration profile.
- Stability of on-board SWICS source

# FM5 Spectral Responsivity



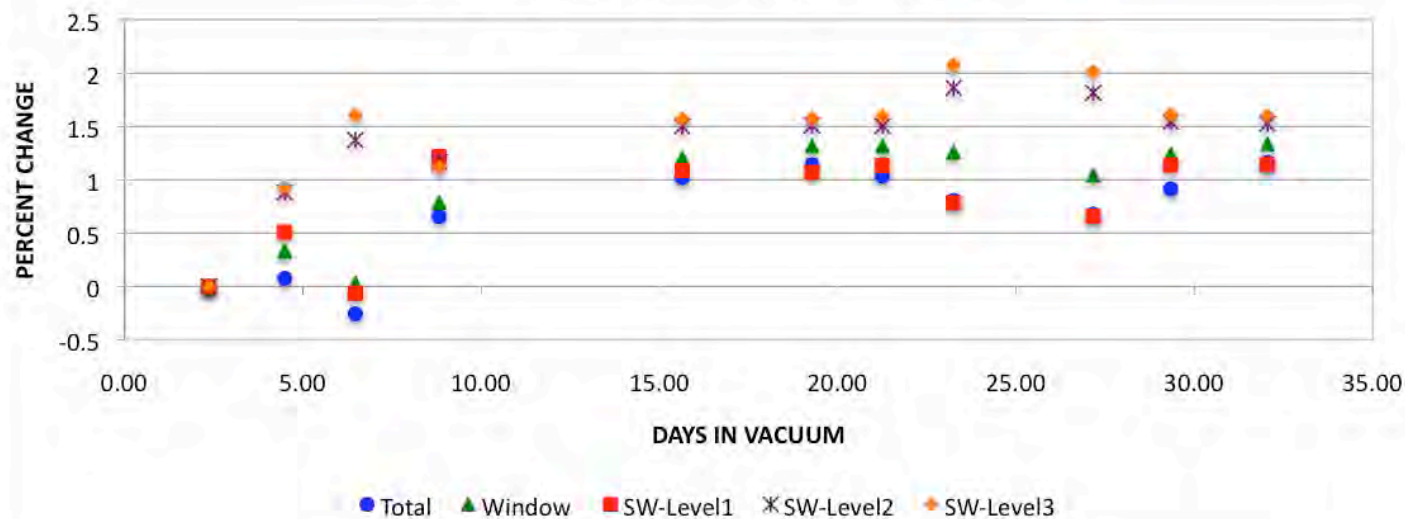
# Sensor Responsivity

IR Sensor reponsivity is stable within 0.06% between two hot acceptance temperatures. Stability in shortwave region is within 0.1% .

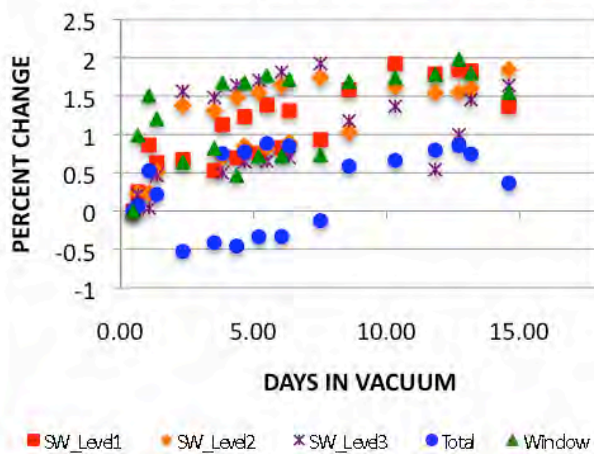
Linearity in sensor gain between hot and cold acceptance temperature is within 0.5% for all three sensors. These values are consistent with the ones derived during 2000 calibration.



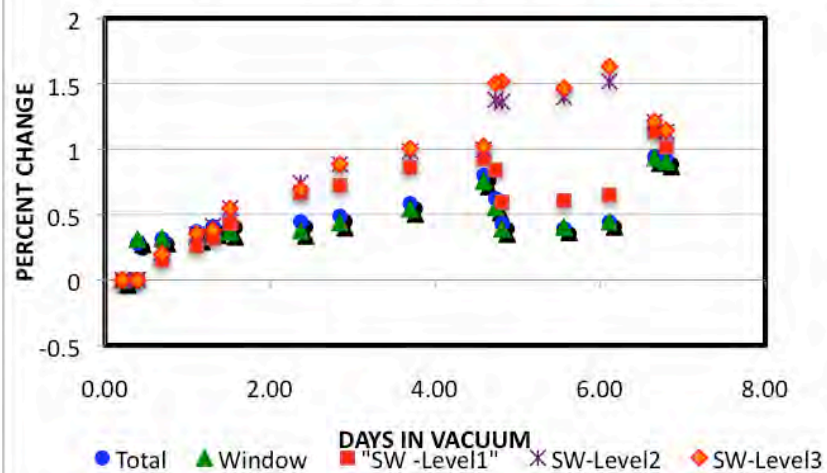
## FM5 2008 GROUND CALIBRATIONS Using On-board Calibration Source



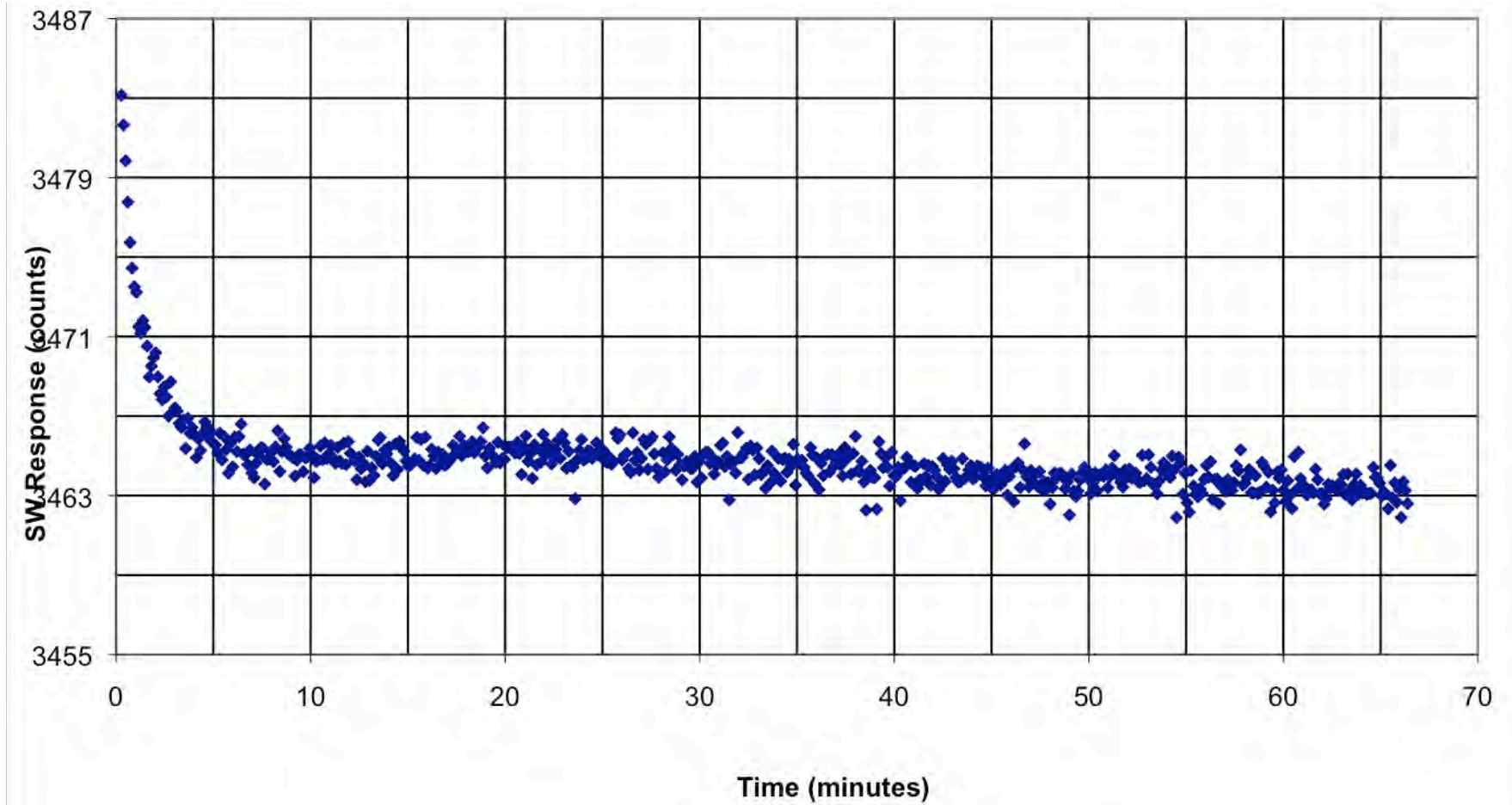
## 1999 GROUND CALIBRATIONS



## 2000 GROUND CALIBRATIONS

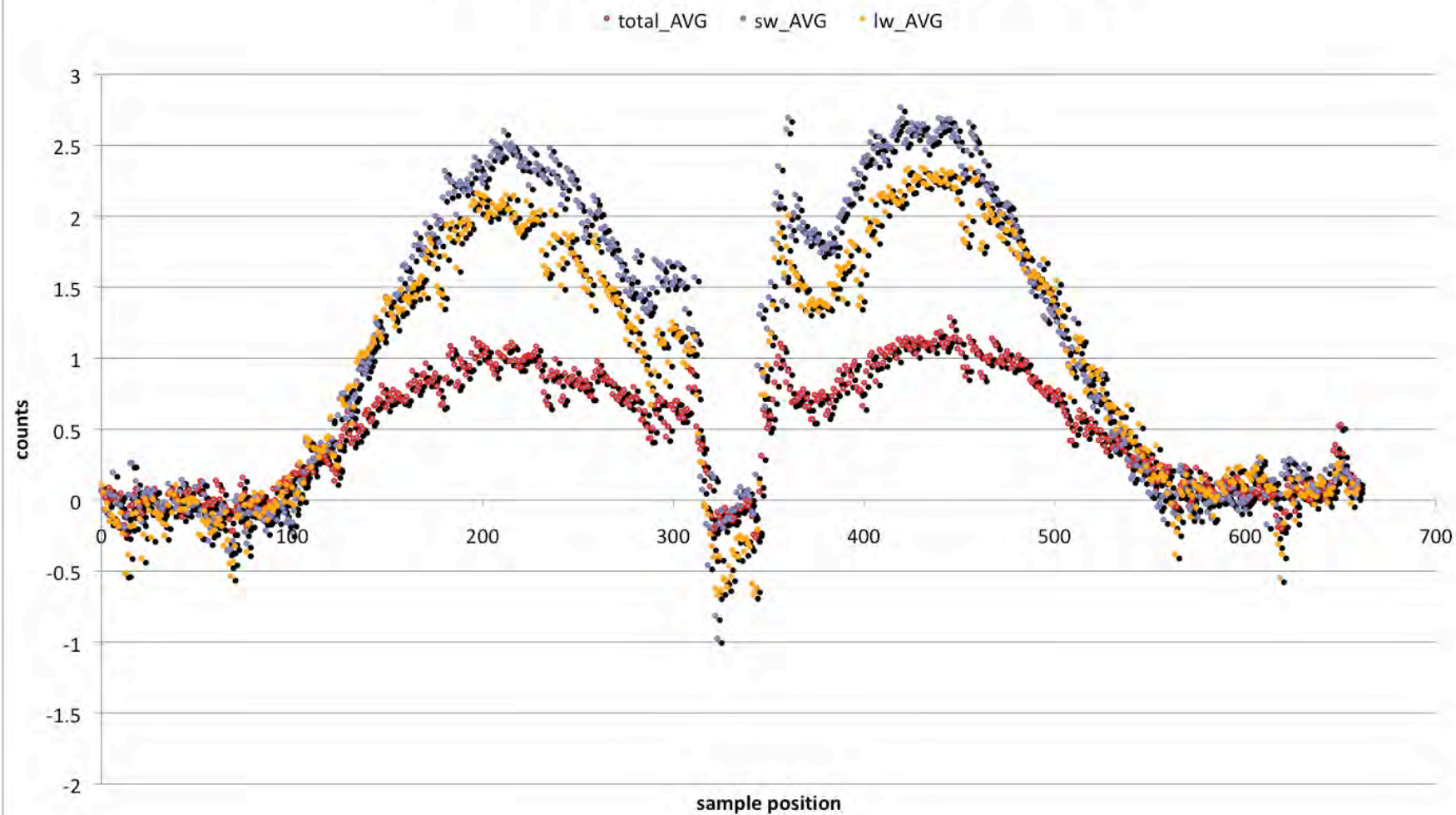


# FM5 SWICS STABILITY



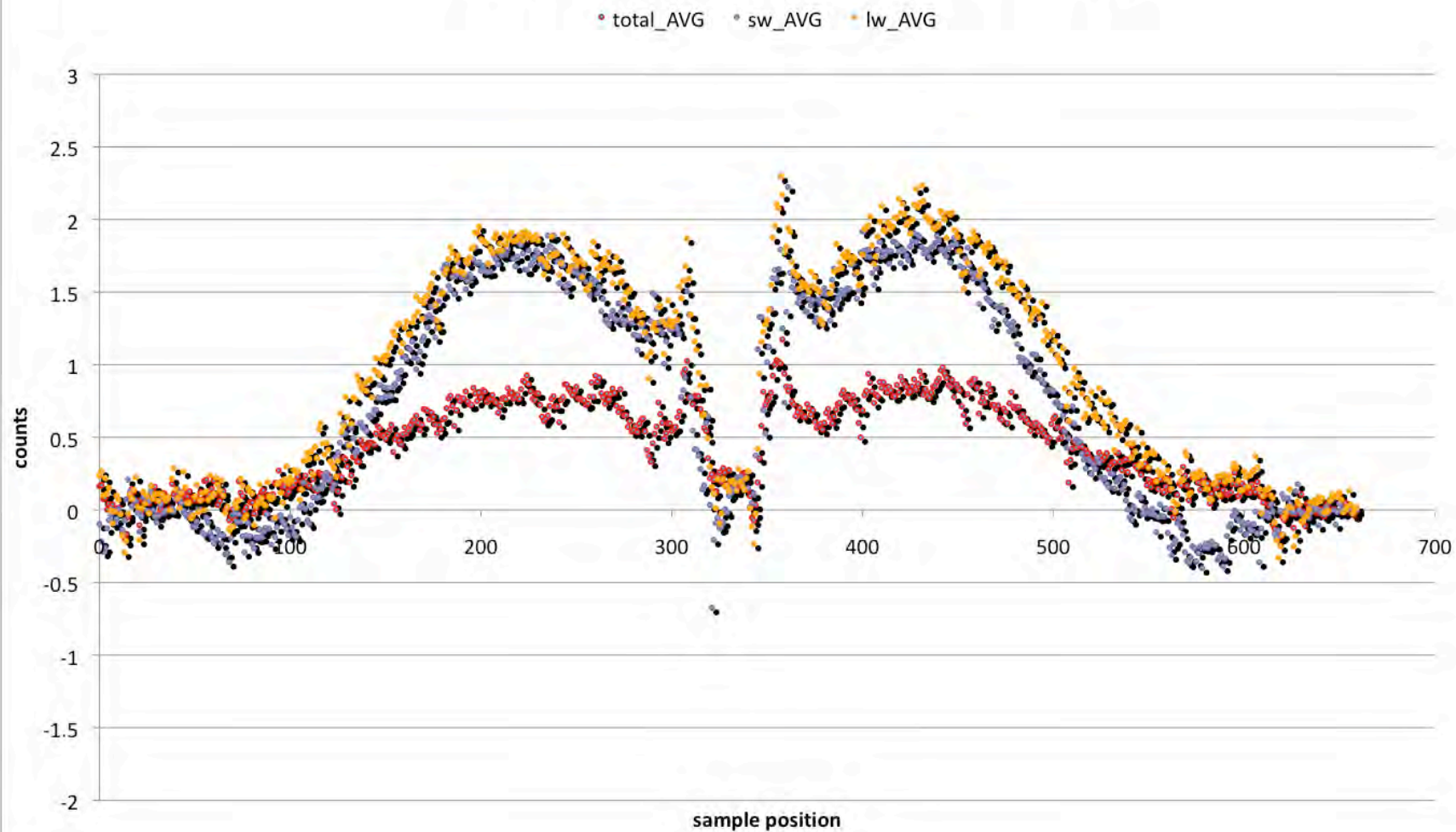
# FM5 Offsets with Test CAPS - 1999

## Az - 90 deg. Elevation Normal AMBIENT



# FM5 Offsets with Test CAPS - 2008

## Az - 90 deg. Elevation Normal AMBIENT





# CONCLUSION

- 2008 FM5 calibration is the most detailed calibration that was done on CERES instruments.
- Several new tests were added and repeated to evaluate the stability of the instrument.
- Initial analysis of the data show no significant change in the performance of the instrument from original calibration.





